



# Mozambique eCooking Market Assessment

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# EnDev/MECS eCooking Market Assessments

- Part of a series of publications produced jointly by Energising Development (EnDev) and the Modern Energy Cooking Services (MECS) Programme.
- Strategic insight on the current state of electricity access and clean cooking, identifying the key opportunities and challenges to the scale up of eCooking in 8 countries across sub-Saharan Africa and South Asia.



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## Overview

- Summary of the opportunity for eCooking in Mozambique
- Clean cooking & electricity access
- Deep dive into:
  - Enabling environment
  - Consumer demand
  - Supply chain
- Recommendations for strategic interventions

# Summary

- The market potential for eCooking in Mozambique is growing rapidly given the upward rise in the proportion of the population with access to electricity, which has doubled, from 17% in 2009 to 34% in 2020 ([ALER, 2021](#)).
- Mozambique has an emerging eCooking sector, with 1.4% of the total population already cooking primarily with electricity ([WHO, 2020](#)).
- Access to electricity and eCooking is concentrated in urban areas, with 73% of the urban population now connected and [UNDP \(2020\)](#) reporting that 17% of the urban population cook with electricity.
- Mozambique's low electricity tariff (\$0.10/kWh) means that eCooking is already the most affordable option, even without considering the generous lifeline tariff (\$0.02/kWh < 100kWh/month). Reliability and access, in particular in rural areas, hinder greater uptake, creating an opportunity to pilot battery-supported and solar-powered cooking.
- Further study of the existing eCooking market in urban areas involving primary research is needed to inform potential future interventions by gaining a deeper understanding of the key actors in the eCooking value chain and the key market segments that have already adopted eCooking.

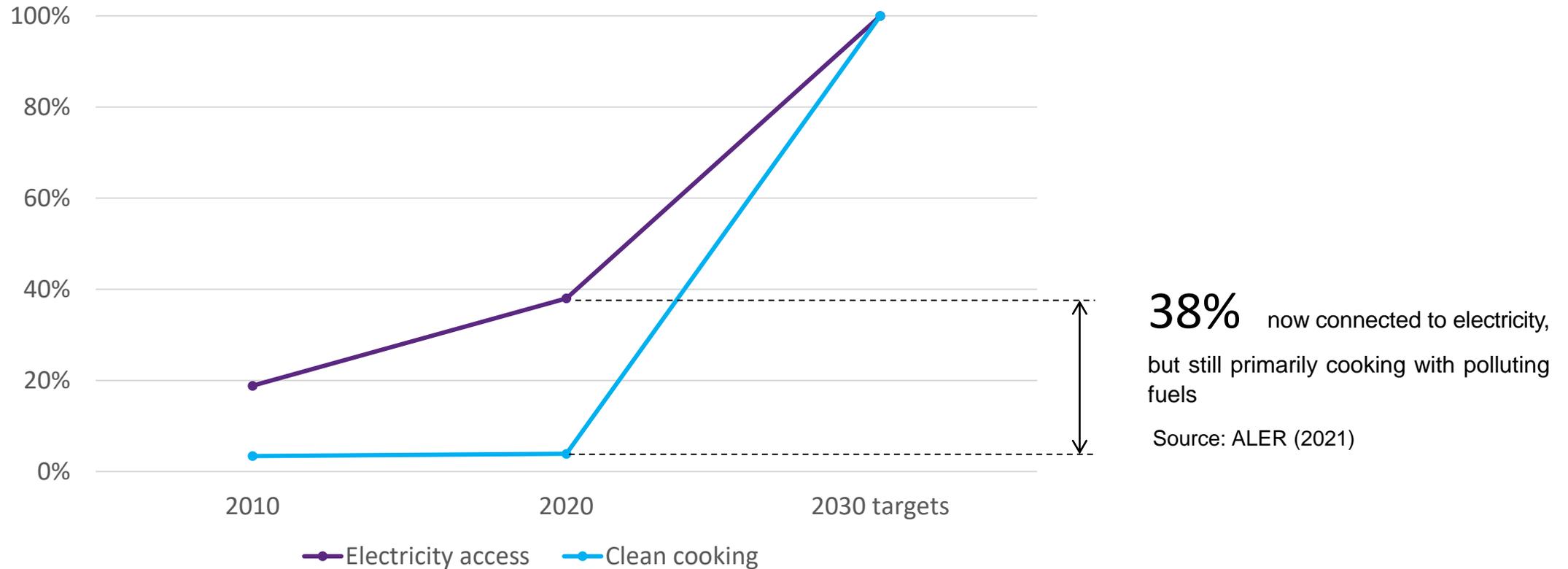
# The clean cooking challenge

- Mozambique faces a formidable clean cooking challenge: Mozambican adults are heavily reliant on biomass for cooking (71.2%) (rural, 91.8% & urban, 33.7%) [WHO, 2019], with firewood being by far the most predominant fuel source (64%).
- 22% (urban, 48.4%; rural, 6.7%) use charcoal as their primary source of fuel for cooking. Only a small portion of the population has access to cleaner fuel sources or energy-efficient technologies for cooking, however, 1.4% primarily use electricity for cooking and an additional 3% (primarily) use LPG [urban, 8.3%; rural, 0.2%) (WHO, 2019).
- This has led to an array of interlinked development challenges: Mocumbi et al (2019) estimate that in Mozambique, 17154 deaths/year are caused by household in-door air pollution; an average of 62.7Mt per year was released into the atmosphere as a result of tree cover loss between 2001 and 2020. In total, 1.25Gt of CO<sub>2</sub>e was emitted in this period.
- Women and girls are disproportionately affected, with greater exposure to cooking smoke, as well as the drudgery of collecting fuel and lighting/tending fires, which results in missed educational and economic opportunities.
- Historically, Improved Cookstoves (ICS) have been heavily promoted in Mozambique by EnDev
- Adoption rates have been high in areas where ICS have been promoted by EnDev ~ 90-95%. However, recent evidence shows that the health benefits of ICS are much more limited than previously thought (WHO, 2016).

# The opportunity for eCooking

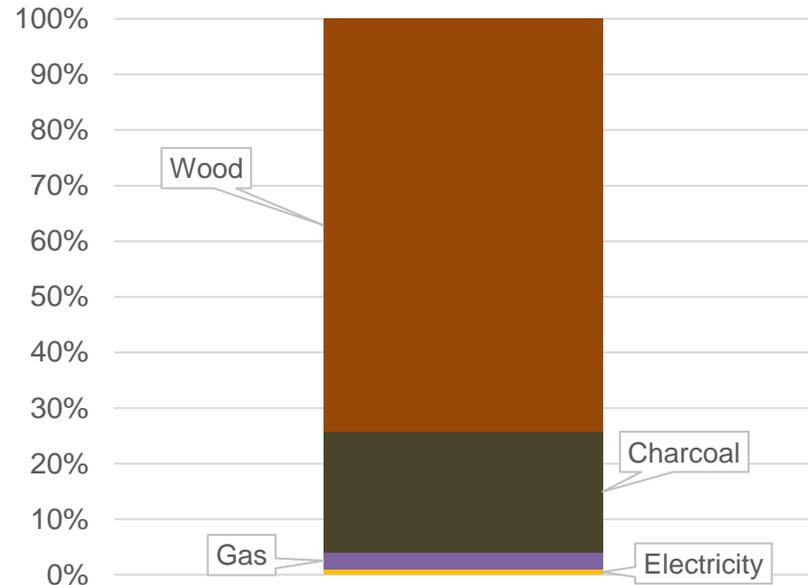
- eCooking presents a potentially transformative opportunity for Mozambique's clean cooking sector to break out of this 'business as usual cycle'.
- Currently, only 1.4% of Mozambicans use electricity as their primary cooking fuel – 0.1% rural & 3.9% urban
- This highlights the enormous untapped potential, as around 40% of the population is now connected to some form of electricity but doesn't yet use for most of their cooking needs (IEA, 2019).
- An eCooking pilot has recently kicked off with Burn Manufacturing (supported to pilot the viability of commercializing EPC (Electric Pressure Cookers) in urban and peri-urban areas of Maputo.
- Electricity access has doubled in the past decade (2009 – 2019), testament to Government's commitment to accelerate electricity access.
- Low cost of electricity: \$0.10/kWh regular tariff and \$0.02/kWh lifeline tariff for the first 100 kWh/month. eCooking is already the cheapest way to cook.
- Mozambique is endowed with considerable hydropower potential and is rich in modern energy resources. At 187GW, Mozambique has the largest power generation potential in Southern Africa.
- There is an existing eCooking sector, and proximity to other countries such as South Africa, Zimbabwe and Zambia where uptake of eCooking is already much higher can potentially yield positive spill-over effects in Mozambique.

# Clean cooking and electricity access in Mozambique



## Cooking energy

**Primary fuel use: 1.4%** cook primarily with electricity

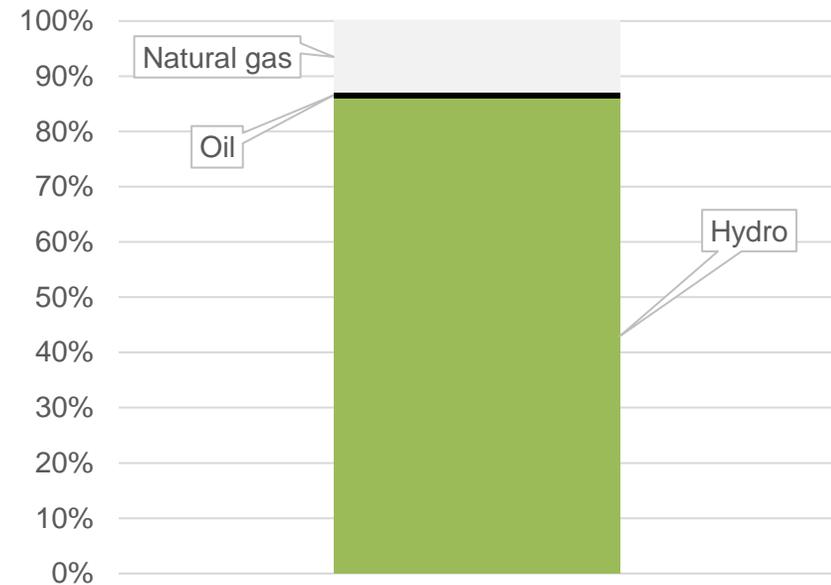


**22%** cook primarily with commercialized polluting fuels (charcoal)

**95%** cook primarily with polluting fuels

## Electricity generation (on-grid)

**86%** renewable

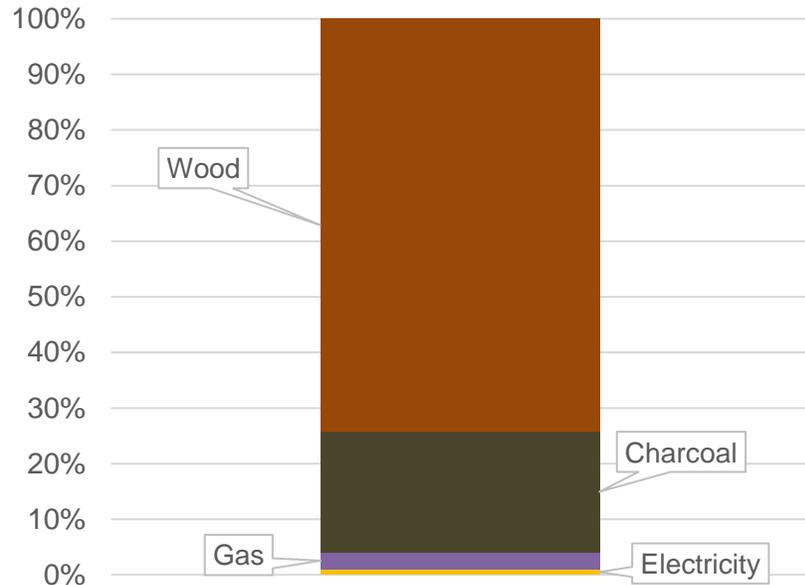


**Surplus** power generation – exporting regionally

**Moderate reliability: 73%** power availability (SAIDI\*SAIFI=2,400hrs/year)

# Cooking energy

**Primary fuel use: 1.4%** cook primarily with electricity



**22%** cook primarily with commercialized polluting fuels (charcoal)

**95%** cook primarily with polluting fuels

# Electricity generation (off-grid)

Mini-grid & off-grid sectors:

- 14,000 mini-grid customers
- 50 mini-grid developers
- 116,000 off-grid lighting/appliance customers
- 70,000 PAYGO SHS

Source: UNDP (2020) & ALER (2021)

# MECS eCooking GMA viability scores/rankings

- GMA = Global Market Assessment
- Scored all low & middle-income countries using international indicators for:
  - economics (clean fuels, market size, financial sector strength)
  - human (policy, health, gender, development, business environment)
  - infrastructure (electricity access, reliability, RE share)
- [MECS.org.uk/GMA](http://MECS.org.uk/GMA)

<b>Mozambique</b>	<b>Overall:</b> <b>115<sup>th</sup>/130</b>	<b>On-grid eCooking:</b> 0.34 – 115 <sup>th</sup> /130	<b>Mini-grid eCooking:</b> 0.317 – 110 <sup>th</sup> /130	<b>Off-grid eCooking:</b> 0.279 – 121 <sup>st</sup> /130
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## Key opportunities

- A strong and ambitious commitment by the Government of Mozambique to achieve universal energy access as well as clean cooking by 2030.
- Electricity access has doubled in the past decade (2009 – 2019), testament to Government's commitment to accelerate electricity access.
- Very low cost of electricity: \$0.10/kWh regular tariff and \$0.02/kWh lifeline tariff for the first 100 kWh/month.
- Existing eCooking sector, and proximity to other countries such as South Africa, Zimbabwe and Zambia where uptake of eCooking is already much higher can potentially yield positive spill-over effects in Mozambique.
- Growth in underserved off grid energy markets, as well as the clean cooking sector.

## Key challenges

- Reliability challenges for the electricity supply.
- High import costs for businesses in the sector due to taxes and tariffs.
- Financial institutions (FIs)' view of the sector as nascent.
- Low consumer awareness of electric cooking and low availability of electric cooking appliances outside of the Provinces of Maputo and Manica.

# Potential impacts of scaled uptake in most viable market segment

If 40% of Mozambique's grid-connected charcoal users (1.7m ppl, 0.4m HHs) switched to eCooking, the [WHO's BAR-HAP](#) tool suggests that:

- **1,412 DALYs/yr** avoided
  - Inc. > 80 lives/yr saved
- **557,000 tonnes/yr CO<sub>2</sub>eq** emissions reduced
  - Already predominantly renewable generation
- **71,000 tonnes/yr** reduction in unsustainable wood harvest
- **104m hrs/yr** of women's time saved
  - 258hrs per household
- **5 months** payback for eCooking appliances (\$80/HH upfront cost, \$195/HH/yr savings on fuel energy costs)
  - Charcoal prices in urban areas high (\$0.4/kg) and electricity tariffs very low (0-100kWh/month lifeline tariff of \$0.015/kWh)
- **n/a GWh** demand for electricity stimulated



**Enabling environment**

# Enabling environment

- **eCooking policy outlook:** Mozambique’s National Electrification Strategy aims to achieve universal electricity access and clean cooking by 2030, but the Strategy separates electrification efforts from clean cooking. The country’s electrification policy is enshrined in the National Electrification Strategy, but the clean cooking sector is not guided by a clear set of policies.
- **Key policy stakeholders:** Electricity Company of Mozambique (EDM), Ministry of Energy (MIREME), Energy Fund (FUNAE), Conselho Nacional de Electricidade (CNELEC), National Inspectorate for Economic Activities (INAE), Mozambican Renewable Energy Association (AMER), National Petroleum Institute, and the Energy Regulatory Authority, “Autoridade Reguladora de Energia -ARENA”.

## **RISE** (Regulatory Indicators for Sustainable Energy) scores:

<b>37%</b>	<b>19%</b>	<b>20%</b>	<b>2%</b>
Electricity Access	Clean Cooking	Renewable Energy	Energy Efficiency

## Targets:

<b>Electricity access</b> 100% electricity access by 2030 (grid/off-grid)	<b>Clean cooking</b> 100% clean cooking access by 2028
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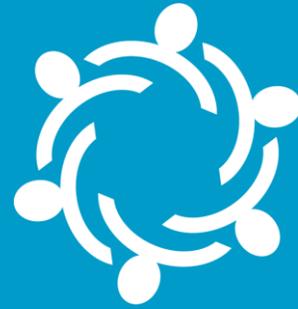
**eCooking cuts across all 4 pillars**

# Key government/NGO programmes creating the enabling environment in which eCooking can scale

- GoM is reducing energy poverty by providing electricity to the poorest groups in remote areas using social tariffs.
- **GIZ/EnDev Mozambique** – EnDev Mozambique supports households in connecting to the national grid, assists in the distribution of high-quality photovoltaic products, and strengthens the distribution of clean cooking solutions.
- **BRILHO Mozambique** – This is a five-year £22.8 m energy access programme in Mozambique funded by FCDO. The programme, which runs 2019-2024, provides catalytic grants, RBF grants, and TA to private energy access and clean cooking companies.
- **Beyond the Grid Fund for Africa (BGFA)** – BGFA, through its second call for proposals (BGFA2), aims to accelerate the provision of off-grid energy services in Mozambique.
- **SDG Results: Access to Renewable Energy** – The objective of the SDF Results Facility is to provide 2 million people in developing countries, including Mozambique, with access to renewable energy.
- **EEP Africa** – The 15th EEP Africa for Proposals (CfP15) attracted applications from early stage off-grid and on-grid clean energy projects in active development phase in Southern and East Africa including Mozambique.

## Key barriers/drivers in the enabling environment

- Relatively low cost of electricity: US\$0.141 per kWh for households (compared to the continent's average) and US\$0.061 for businesses.
- Fiscal benefits for renewable energy investors, but not applicable to cooking.
- Low consumer awareness of electric cooking and low availability of electric cooking appliance.
- Low access to electricity amongst the rural population
- Unreliable electricity supply

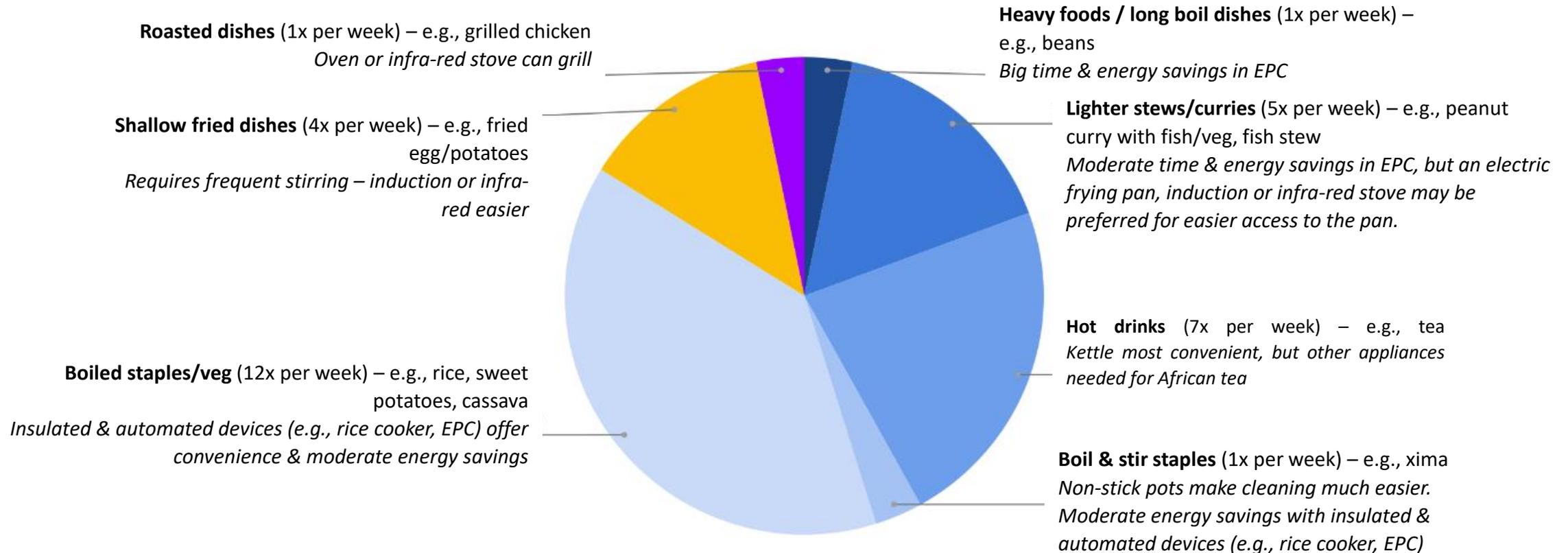


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**Consumer demand**

# Consumer demand

In an average week, a typical Mozambican household might prepare:



# Popular meal combinations in Mozambique

- Popular meal combinations in Mozambique include:
  - **Rice and peanut curry** – rice is the most important staple meaning that rice cookers are likely to play an important role. Rice is often accompanied by a peanut curry, either fish or vegetable. Although boiling is the dominant cooking process, frying is also likely to be used to develop flavour. Fish and vegetables are relatively quick to cook, so induction/infra-red or an electric frying pan may be a good match.
  - **Fried egg/potatoes and tea** – Although you can cook African tea very easily on an EPC (without pressurizing), many people will choose a sufuria (saucepan) on an infra-red/induction stove instead. The same applies for eggs/potatoes, but a shallow frying pan is likely to be preferred.
  - Most viable energy-efficient appliances: **rice cookers, induction, infra-red, electric frying pan, kettle**

# Demand creation

- **Key marketing messages:**

- Energy-efficient appliances offer substantial time and cost savings and enable multi-tasking.
- EPCs are the cheapest and most convenient way to cook heavy foods, but as boiling times are relatively short (<1hr) for most dishes, EPCs are likely to offer less value than in other contexts where 'heavy foods' make up a greater proportion of the menu.

# Key market segments

- *Charcoal users*
  - 6 million Mozambicans use charcoal as their primary fuel and many more use it as part of their fuel stack.
  - The majority of whom are in urban areas and are now connected to the national grid.
  - Unlike firewood, charcoal is almost always purchased, creating an attractive existing expenditure to convert into electricity units.
  - Charcoal is now the most expensive way to cook, leaving many looking for an alternative.
  - Mozambique has a relatively low electricity tariff, so even cooking with inefficient electric appliances is already cheaper than charcoal.
  - Energy-efficient appliances such as rice cookers or induction stoves offer a highly attractive modern alternative that can further reduce expenditures on cooking fuel, however the upfront cost is a substantial barrier for many who use charcoal, which can be purchased in small quantities.

# Key market segments

- *Electricity Users*

- 1.4% of Mozambicans already cook primarily with electricity, the majority of whom are in urban areas.
- Neighbouring Zambia, Zimbabwe and South Africa already have much higher proportions of the population cooking with electricity and in South Africa the majority of the population already rely upon electricity for cooking.

- *LPG Users*

- About 4 percent of households (about 0.26 million) currently use cleaner fuels, primarily LPG, as their primary fuels (WHO, 2019).
- The main driver of LPG uptake in southern Mozambique is a decline in biomass availability, which has made charcoal expensive.
- LPG distribution is costly in some parts of Mozambique, particularly in the north.
- However, the government has put in place a price cap on, and controls the sale price of, LPG (SNV 2013).

# Key demand side barriers/drivers

- A demand-side survey conducted by [Mudombi et al. \(2018\)](#) show that eCooking in Mozambique is driven by the following perceived advantages of eCooking appliances:
  - Simplicity in usage
  - Convenience
  - More economical - cheaper than charcoal and LPG
  - Clean to use
- **However, large-scale uptake is constrained by:**
  - Limited consumer knowledge on the associated health and safety benefits of eCooking
  - Low consumer awareness of electric cooking and low availability of electric cooking appliances
  - Cultural values and preferences



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**Supply chain**

# Supply chain

- **Key domestic eCooking appliance manufacturers:**
  - N/A
- **Key eCooking appliance distributors:**
  - N/A
- eCooking products are mostly imported from South Africa (with a share of 56%), China (with a share of 25%) and Turkey (with a share of 6.75%), with ICS sometimes locally assembled using parts from South Africa. EPCs are mostly imported from India.
- Imported products are available through local distributors in urban areas, with the bulk of the more well-known retailers mentioned below having a presence in Maputo. eCooking appliances are not currently available in rural areas.
- [Source: https://trendeconomy.com/data/h2/Mozambique/7321](https://trendeconomy.com/data/h2/Mozambique/7321)

# Innovative eCooking pilot projects

- **Emerging mini-grid and SHS industries; also, recently began to experiment with eCooking.**
  - Some solar mini-grid pilots were financed by Government of South Korea, but most installed mini-grids were financed by Fundo de Energia/National Fund for Rural Electrification (FUNAE) and are diesel powered with operational and reliability concerns, an issue that is likely to slow the uptake of these larger systems.
  - Last year, FUNAE launched a tender for the development of 5 solar mini-grids, under the second phase of the Renewable Energy for Rural Development program introduced by the government in 2018 and part financed by Belgium.
  - There is also an issuance of a request for expressions of interest to seek consultants to draft feasibility studies and project outlines for additional 11 solar mini-grids.
  - The focus on off-grid systems has shifted from standalone systems to mini-grids, due to their greater rural development potential. EnDev is currently prioritising pico-and micro-hydro (PHP and MHP), and small-scale PV as well as working with Burn Manufacturing to experiment with eCooking, while BRILHO is expected to attract regional off-grid energy market leaders into the Mozambican market.
- Source: <https://www.get-invest.eu/market-information/mozambique/>

# Key supply side barriers/drivers

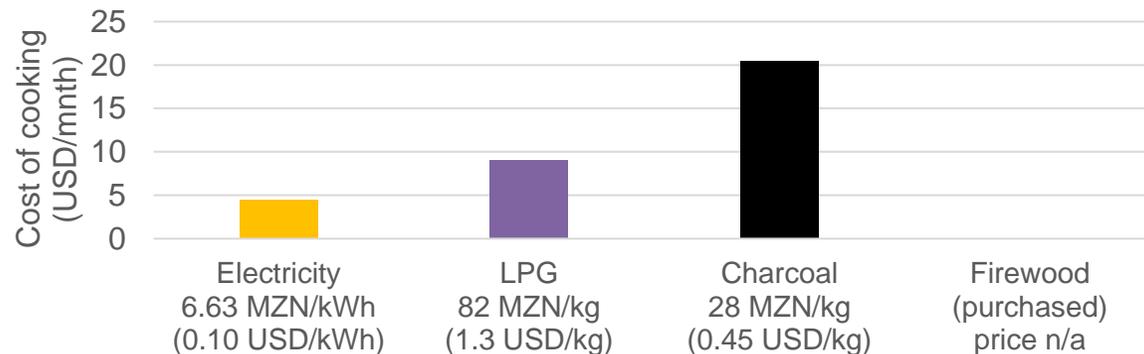
- eCooking is already a mainstream solution, with UNDP (2020) reporting that 17% of urban households already use electricity to cook and WHO (2019) reporting that 3.9% of urban households already use electricity as their primary cooking fuel.
- Strong supply chains for importation of appliances from China and South Africa in place, with many companies now expanding product range into energy-efficient eCooking appliances.
- The distribution infrastructure in the eCooking and off-grid sectors can be improved. There are high distribution costs due to the thinly dispersed rural areas and the vast distances between the ports of Nacala, Beira, and Maputo and the interior regions, which is worsened by the poor state of the road network, significantly driving up transportation and logistics costs.
- Limited access to after-sales services for modern energy-efficient electric cooking appliances, especially outside of the major cities.
- Reliability of electricity prevents many from using it for cooking. Although it is improving in major cities, it remains poor at the fringes of the grid (slums, rural areas) and most of the country still off-grid.
- High import costs for businesses in the sector due to taxes and tariffs. Renewable energy solutions such as eCooking appliances are subject to VAT rate of 17% and import duties vary between 7.5% and 20% depending on the component type
- Several suitable consumer financing mechanisms are already in use in Mozambique, but have not yet been applied to eCooking:
- Several international organisations who are piloting eCooking in other countries are operating in Mozambique, e.g., Engie, Burn Manufacturing.

**Popular appliances in Mozambique today: N/A**

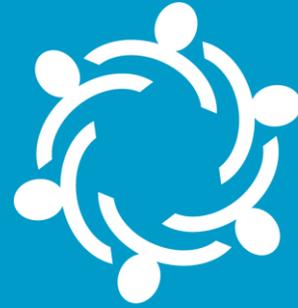


# Relative cost of eCooking vs. popular cooking fuels

- The regular grid tariff is low enough that in urban grid connected areas, cooking with electricity is already the cheapest way to cook your your food in Mozambique.
- The lifeline tariff is 5 x lower and at 100kWh is generous enough to enable households with few other appliances to cook all their food with electricity at very low cost, although it must be noted that there might be issues with going over the allowance.
- Mini-grids are also obliged to charge the same tariff as the national grid in Mozambique, meaning that eCooking is just as cheap for mini-grid customers as it is for grid-connected households.



<b>Grid electricity tariffs:</b>
• <b>Regular: 6.63 MZN/kWh</b> (0.10 USD/kWh)
• <b>Lifeline: 1.07 KES/kWh</b> (0.02 USD/kWh) < 100kWh/month
<b>Mini-grid tariffs:</b>
Universal tariff policy: mini-grids = grid tariff



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## Recommendations for strategic interventions

# Recommendations

		Current status	Recommended interventions
Market segments	On-grid	Doubling electrification rate in the past 10 years. Urban access much higher than rural (73% vs. 2%). National utility keen to stimulate demand for its surplus predominantly renewable electricity - exporting to neighbouring countries & offering very generous lifeline tariff, However many households are afraid to use above this amount for fear of being reclassified as a regular consumer and losing lifeline status. Reliability still a challenge.	Pilot battery-supported eCooking to mitigate grid reliability concerns.  Target urban Mozambicans with awareness raising campaigns, focussing on the fact that electricity is already the cheapest way to cook and that the lifeline tariff allowance is more than enough to allow low-income households to cook with energy-efficient appliances and make substantial savings on cooking fuels. Lobby the Utility to safeguard the lifeline amount for consumers to make eCooking more attractive is important.
	Mini-grid	Most existing MGs diesel, however growing interest in RE MGs, in particular solar. Universal tariff policy means that Mozambique's lifeline tariff also applies to mini-grids.	Support piloting of eCooking on solar & hydro mini-grids, leveraging universal tariff policy to offer very affordable eCooking services using the generous lifeline tariff allowance Support FUNAE and consultants developing Eols to integrate eCooking into the planning for forthcoming solar mini-grids.
	Off-grid (SHS)	Awareness & ownership high for a relatively early-stage SHS market – 68% have heard of solar products and 27% already own. However, none of Mozambique's SHS companies have started experimenting with eCooking yet.	Support Mozambican SHS companies to explore eCooking with grant funding for conceptual design and pilot projects.

# Recommendations

		Current status	Recommended interventions
TToC dimensions	Supply chain	<ul style="list-style-type: none"> <li>- Supply chains for eCooking appliances already in place, importing products from SA, China and India. However, key market players, the types of appliances &amp; import volumes not known.</li> <li>- Several multinationals present in MZ already piloting eCooking and preparing to expand their pilots to MZ.</li> </ul>	<ul style="list-style-type: none"> <li>- Support RBF programmes to connect EA &amp; CC dimensions to ensure demand is created from the outset, e.g. incentivising combined provision of electricity connections &amp; eCooking appliances.</li> <li>- Carry out a more detailed study of the existing eCooking market involving primary research to understand the supply chain, e.g. who the key market players are, the most popular appliances.</li> <li>- Support multinationals already piloting eCooking in other countries to expand their pilots into Mozambique.</li> </ul>
	Consumer demand	<p>17% of urban Mozambicans already cook with electricity, however little is known about this market segment. Electricity already presents the cheapest option to cook in Mozambique.</p>	<p>Carry out a more detailed study of the existing eCooking market involving primary research to understand the key market segments who have already adopted eCooking, the compatibility of different types of appliances with local cuisine and the barriers constraining further uptake</p>
	Enabling environment	<p>Current policy framework is supportive of electrification, but not electric cooking.</p>	<p>Raise awareness amongst policy makers of the need to address the clean cooking challenge, highlighting the role of eCooking in addressing it whilst simultaneously stimulating demand for surplus renewable electricity.</p>



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- Cross-country comparison
- Impact modelling methodology
- Guiding framework